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(71)(72) Applicants and Inventors: GALVIN, Barbara, Mary, Rebecca [IE/IE]; Newtown, Claremorris, County Mayo (IE). GALVIN, Rachel, Audrey [IE/IE]; Newtown, Claremorris, County Mayo (IE).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: O'CONNOR, Declan [IE/IE]; Deerpark, Newmarket-on-Fergus, County Clare (IE).

(74) Agents: O'CONNOR, Donal, H. et al.; Cruickshank & Co., 1 Holles Street, Dublin 2 (IE).

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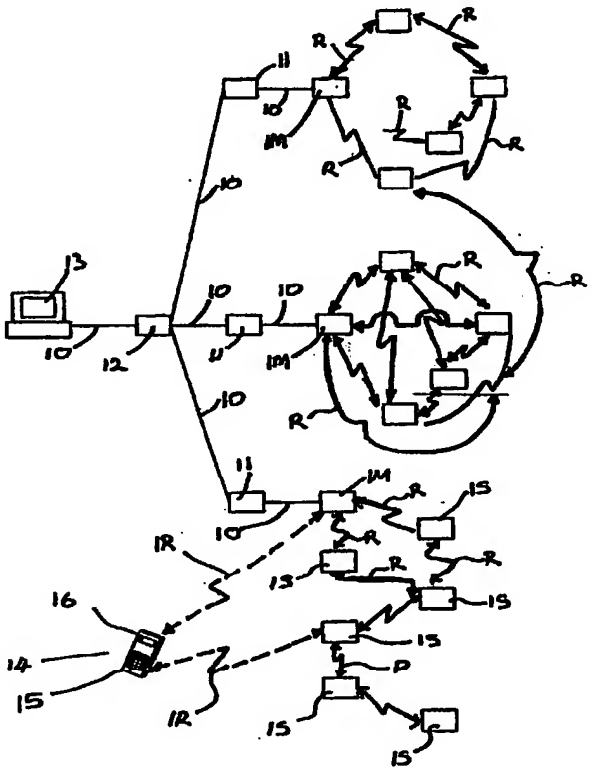
(54) Title: A PARKING METER SYSTEM

(57) Abstract

There is provided a parking meter system. There are a number of meters linked together by a radio link (R). One of the meters is a master meter (1M) and the remainder of the meters are slave meters (1S). Each master meter (1M) of a set of meters has a further communications link by a land based cable (10) and a modem (11) to a central host control unit (13). Additionally hand-held inspection devices (14) are also provided for interrogating the meters by, for example, traffic wardens or other such personnel. Various combinations of radio link (R) may be provided. The purpose of the system is to allow the control of the use of parking bays in cities and other congested areas, particularly where on-street parking is provided. The system uses a programmed card which incorporates payment means for debiting on using a parking meter. The system is adapted to provide relevant information to users of the parking bays, as well as those authorities, public or private who control the parking bays and traffic generally.



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"A Parking Meter System"

Introduction

The present invention relates to a parking system.

It is universally acknowledged that as congestion increases in our cities and the control of on-street parking becomes more critical that the use of parking meters increases. Heretofore they have been found to be the most efficient way of controlling on-street parking, however, they suffer from certain operational problems. Firstly, a large number of traffic wardens are required to police the operation of the parking meters and to ascertain when unauthorised parking is taking place, when parking meters are defective, etc. Indeed, it is often very difficult for a warden to detect that a parking meter is not operating correctly since superficially a parking meter may not indicate that there is any fault in the meter since it simply displays there is still free time available on the meter, the parking time has elapsed or some other display does not necessarily make it apparent that the meter is inoperative. Nor indeed will a superficial glance at the meter show that, for example, the coin-released mechanism is in some way jammed or inoperative. Thus, at the very basic level of the operational efficiency or maintenance of individual meters, there is, at the present moment, very little that the traffic warden can do to ascertain operability of individual meters.

There is also a problem in relation to the motorist with most of the parking systems in that when they do not work correctly or when, for example, it is a parking system that requires the display of a ticket and for some reason the ticket gets lost, obscured or damaged, the motorist feels aggrieved and therefore there is a lack of cooperation between the authorities controlling the parking system and the motorist. If the parking system could be more efficient and user friendly, then this would benefit both the authorities and the motorist.

A further problem in relation to conventional parking meters is that money has to be collected on a regular basis from the meter, which poses a security as well as a collection cost.

However, all of these disadvantages pall into insignificance when one considers the major operational problems inherent in the present construction of parking meters once one accepts the basic principle that parking meters are not simply revenue earning devices, but are inherently involved in traffic control in congested areas. Once one accepts the proposition that parking meters are a means for controlling the flow of traffic and in particular to controlling how vehicles are used within cities and other congested areas, then it is possible to realise immediately that those attempting to control traffic have absolutely no information available to them at present on the use and abuse of parking meters.

It is vital that if traffic flow is to be controlled within cities both on a short and long term basis that those in authority with responsibility for this function have as accurate data as possible, not alone in respect of long term vehicle use, but also daily and hourly traffic conditions.

There is a particular need to be able to control the use of individual, or at least sets of parking meters in different streets possibly so as to influence parking patterns to the benefit not alone of the business community, but also the users of these establishments, whether they be retail stores or, places of amusement, or restaurants.

A further problem that occurs, unfortunately on a more regular basis than anybody considers acceptable, is severe traffic congestion caused by accidents on major thoroughfares. It is not unusual to find that what has been a relatively minor accident or mishap on a road has a cascading affect on traffic flows. The authorities are unable in many instances to divert traffic away from these trouble spots in sufficient time after such an accident to prevent inordinate delays for the commuter. Indeed in many instances one can well appreciate that it would be in both the motorists and the authorities best interest for the motorist not to vacate the parking bay but simply to wait for some time until the problem had been resolved.

An underrated problem is the need to control the use of parking meters at different times of the day. Thus, for example, at certain busy periods it may be desirable to increase the cost of on-street parking, while at other times the tariff should be and could be reduced.

It is also envisaged that the time is not too far away in many cities where off street parking mainly in parking lots and car parks generally will have to be centrally controlled. Thus, it is likely that the equivalent of parking metres will be required in these buildings not necessarily for the collection of payment which is relatively efficiently achieved now in the sense that payment must be made prior to being able to vacate such a parking lot or parking area but to ensure that parking areas are being run in accordance with public policy.

In this specification, it is envisaged that various types of information may be required and provided which information will not necessarily all be freely available to everybody. It is also appreciated that what is useful information to one person such as the motorist or user of the parking bay is possibly irrelevant to the authorities and similarly information that the authorities find useful may be totally irrelevant to the motorist. Further, for example, for those controlling the parking, they may not necessarily want the motorist to be aware of all the information that the authorities or their employees have. Thus, in this specification, while the term "information" or the term "useful information" is used, it must be appreciated that the nature and extent of this information will vary depending on the person requiring the information and indeed their circumstances, whether it be, as mentioned above, the need for strangers to have instructions in their own language, traffic information, use information, and so on, or whether it is for the authorities to be able to inform motorists in other areas that there are parking bays available.

Further, in this specification, the term "programmed cards" or "cards" is used in a very general sense and it is envisaged that such cards include, not alone cards similar to, for example, simple programmed cards such as cards used to operate phones, gain access to facilities such as transport tickets, swipe cards and the like but also so-called smart cards with processors, memories, and even displays such as those with sophisticated electronic purse functionality. The level of sophistication of the card will depend entirely on the use to which the card is being put and may in fact be either specific cards dedicated entirely to the particular parking system and usable only therewith or in other circumstances, the card could in fact be a card already in a motorist's possession such as the aforesaid smart card incorporating electronic purse

functionality or indeed many forms of credit card. This specification does not envisage any limit to the type of card being used once that card is able to provide the necessary functionality for the user and operator of the system.

An unrelated problem, but one that does cause a certain amount of difficulties, is the need for people to have the correct change to use in meters so that in many instances, it has been proposed to use various forms of credit cards and the like in parking meters, however, these have to date proved unsatisfactory for many reasons.

The authorities are continually trying to increase the efficiency of the enforcement of parking regulations and in particular to avoid the use by a certain minority of motorists of parking bays beyond the allotted time span. This is done either by the motorist overstaying the length of time he or she should be parked and simply driving off before the authorities have discovered the unauthorised parking or alternatively by "feeding the meter", in other words, topping up the meter from time to time to ensure that the car occupies a parking space apparently legally for a considerable time span. Indeed, it is not unknown for many people to consider the risk of the relatively small fine when discovered as being well worthwhile paying to achieve what is effectively all day on-street parking in busy congested areas. Therefore, some way of ensuring that this does not happen or can be easily detected and dealt with would be advantageous.

Another problem in relation to parking meters is that because they do not display much useful information in relation their use, their operation has to be kept relatively simple. However, even what could be said to be reasonable simple pieces of equipment, namely, parking meters, do cause strangers in cities problems and in particular cause problems for those from other countries. In the larger cities of the world where there is everyday a considerable influx of foreigners this problem can be quite acute. The parking meters will usually only display information in the language of the country.

In summary, parking meters should be operated and maintained more efficiently than at present. Further, they should be operated more flexibly to give greater control of their use at various times of the day and depending on specific traffic conditions

prevailing at that particular moment in time. Parking meters should be more user-friendly. They should provide those responsible for traffic control with data to enable the long term traffic problems and traffic flow of cities to be identified and controlled where possibly. Finally, it would be desirable for the authorities to be able in some way impart vital up to date traffic information to drivers before they get into their cars to drive away from a parking bay.

The present invention is directed towards overcoming these problems and providing some of the additional information that is desirably required not alone by drivers, but also by those with the ultimate responsibility for traffic flow and planning in cities and other congested areas.

Statements of Invention

According to the invention, there is provided a parking meter system comprising:-

at least one set of meters, namely, a master meter and a plurality of slave meters for control of parking bays;

an operations controller for each meter;

an elapsed time display for each meter connected to the operations controller;

a set data communications link between the meters in a set of meters;

a central host control unit for the master meter; and

a main data communications link between the host control unit and the master meter.

A primary advantage of this system is that the central host control unit has total control over the real time behaviour of the master meter and its associated slave meters and obviously where there is more than one master meter, it then has total control over many. The correct operation efficiency of each meter can be ascertained on a real

time basis: further the actual usage of each of the meters can be ascertained. Thus, for example, it is possible to control more accurately the use of the various meters.

Ideally, the set data communications link is a radio link. It is much more advantageous and less expensive than to have a full secure set data communications link between the meters in a set of meters.

Ideally, the radio link between the meters is between each slave meter and each master meter in series and parallel. This ensures that when one meter goes down, all the others don't go down and it is possible to transfer information from one meter to the other.

Ideally, the control means is an electronic control means.

Preferably, the electronic control means is operated by a programmed card incorporating payment means for debiting on payment for parking. Many different types of cards with many different functionalities can be used, however, the great advantage of using a card is it obviates the need for money and the collection of money.

Preferably, the payment means incorporates means for storing as a card credit a preset amount of currency for subsequent debiting on payment for parking. When the payment means is not a debit card or a credit card, it is advantageous that motorists be able to purchase a separate card for the payment of the parking. Indeed, in many instances, the system may only allow for the use of separate dedicated cards for use in the parking system according to the invention.

In this latter embodiment, the payment means preferably incorporates limit means to prevent use of the card after the card credit stored falls below a preset limit. The advantage of this is that when a motorist uses a dedicated card or a card which has credit stored therein, they cannot simply get away with unauthorised parking in the particular parking bay. This could happen if all the credit on the card could be used to purchase the particular parking and exactly the same situation would arise as heretofore. However, by retaining a certain amount of credit on the card, if the

motorist overstays his or her time on the meter, then when he or she attempts to get a credit for the unused money on the card, this will be detected and no such credit will be given either to the purchase of a new card or simply as a refund.

In one embodiment of the invention, the refund means is provided for crediting the card with a payment made for unused parking on reinsertion of the card on vacating the parking bay. This may be required to encourage motorists to pre-pay as much as possible. It may be administratively advantageous.

Preferably, additional debiting means is provided for debiting the card with previously unpaid for parking. Again, everything is being done to ensure that motorists do not get away with unauthorised parking.

In one embodiment of the invention, the control means includes disabling means to prevent reuse of the card until reactivated by reinsertion into the meter where last used. The advantage of this is that there can be accurate recordal of when a vehicle was parked and when it left the parking bay and this will give as accurate a record as possible of the presence or otherwise of cars in parking bays. It would probably be the rare motorist that would leave the parking bay without having deactivated the card since the motorist will then be paying for the parking. This will be the closest to providing what is urgently required, namely, a means for sensing whether a parking bay is occupied or not.

Preferably, the control means includes reset means to delete any unexpired parking time stored in the operations controller as available for use and to reset the elapsed time display to indicate the state on reinsertion of a card on vacating the parking bay. The advantage of this is that there will be full payment for all parking and people will not be able to get "free parking".

Preferably, location means are provided for indicating on insertion into a meter the identity of the previous meter where the card was used. The advantage of this is that if somebody mislays their car or forgets where they parked it or indeed gives the keys of their car to somebody else to collect it, it will be possible for that other person to easily locate where the car is parked.

Preferably, each operations controller has storage for two operating systems and incorporates means for switching from one system to the other. The advantage of this is that software can be downloaded efficiently onto each meter or simply each meter can have a duplication of the program being used so as to switch over to it in the event of any failure. In many instances, particularly where there is a radio link between a master meter and a slave meter, communication of a new program when a fault occurs may not always be that easily achieved. It will be appreciated that where radio links are used, that they are obviously subject to electromagnetic interference which could corrupt data flow. A great advantage of having duplicate storage is that downloading does not become a major problem. Another advantage is that in having two sets of software available in any particular meter, it is possible, for example, if a new version of software is to be provided on all the meters and introduced at the one time, that it can all be stored in readiness for the changeover.

Preferably, the meter includes display means for providing useful, as defined herein, information to the user. Needless to say, the type of information that the user will require will depend on the user's circumstances. In many instances, it could be traffic information, in other instances, how to use the meter, in other instances, instructions in a different language and indeed, in many instances, it could even contain more detailed information such as the best route to take from one place to the other, all of which depends on what information can be available for transmittal to the meter.

In another embodiment of the invention, the meter includes means for preventing the operation of a meter until additional vehicle identification means is inputted into the meter. This would be an advantageous way of ensuring that "feeding" of meters was not carried out. If a motorist were to insert a false registration number, for example, as vehicle identification, this would be immediately identified as incorrect by any visual inspection. Further, it will be appreciated that the inputting of identical vehicle identification to that last used on the meter could be such as to invalidate the operation of the meter.

Preferably, the system comprises:-

a plurality of sets of meters;

means for downloading to a master meter through the data communications link information from other master meters; and

means for accessing this information at each master meter.

There is a considerable advantage in being able to get all the information from all the master meters and then downloading it onto the other master meters so that people would be able to ascertain, for example, by querying one of the master meters whether there was parking available in other areas.

Further, the invention provides a short range transmitter for each master meter and a receiver for reception of data from the meter and preferably such a remote infrared receiver would be a hand-held receiver and could be operated by traffic wardens so that as the traffic warden progresses from place to place, he or she will be able to receive direct communication in respect of the operation of each master and slave meter. It could also be used for example to interrogate each meter and discover quickly whether there were any apparently unused parking bays in a particular area. It would also facilitate the traffic warden in the identification of unauthorised parking since querying, for example, of a master meter would ascertain whether a considerable number of the meters in the area were being legally or illegally used and would further identify those meters being illegally used. It could also be used to quickly direct the warden to streets where unauthorised parking was apparently taking place.

Ideally, each meter is a stand-alone unit having its own microprocessor unit and capable of operating independently of other units. This increases the functionality of the system in that when one meter fails, all the other meters do not fail. Also, due to the sophisticated communications system used, the fact that the meter is out of operation can be, for example, indicated on another meter such as an adjacent meter on the master meter or the like so that the motorist will not be frustrated in trying to use the meter. Further, the authorities will be immediately aware of such defective meter and the necessary maintenance can be achieved.

Ideally, each meter controls more than one separately identifiable parking bay. The more sophisticated the controls and the more sophisticated the display, the less need there is for individual meters.

Ideally, in this system, public display units are provided connected to the central host control unit to display relevant information to the public. At the present moment, such information is often given in respect of off-street parking, however, it is generally inaccurate and it is envisaged that the present invention would improve the accuracy of such information. Further, it would allow the authorities to provide information not alone about off-street parking but also about on-street parking.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof given by way of example only with reference to the accompanying drawings in which:-

Fig. 1 is a perspective view of the physical construction of a parking meter according to the invention;

Fig. 2 is a perspective view of another parking meter according to the invention;

Fig. 3 is a flow diagram illustrating the functional operation of the parking meter;

Fig. 4 is a schematic view showing certain radio links;

Fig. 5 is a schematic view showing the use of another device according to the invention; and

Fig. 6 is a view showing the operation of the system.

Referring to the drawings and initially to Figs. 1 and 2 there is essentially no difference between these two parking meters, except insofar as they are physically somewhat different in appearance.

Referring to Fig. 1 there is illustrated a parking meter indicated by the reference numeral 1. The parking meter 1 is in the form an upright bollard having a control panel indicated generally by the reference numeral 2 and normal indicia 3 showing that it is a parking meter. In the following drawings where a parking meter 1 is used as a master parking meter it is identified by the reference 1M and where it is used as a slave parking meter it has the reference 1S. However, for the general public there will generally be no difference in appearance between the two parking meters.

Prior to discussing the functionality and operation of the parking meter 1 it is useful to describe the meter insofar as it will appear to the user. The parking meter 1 has a conventional liquid crystal display 4, a card insertion slot 5 and operating buttons, namely a bay select button 6, a time select button 7 and pay select button 8. General instruction indicia 9 is printed on the control panel 2. In its simplest form the parking meter 1 controls the use of four parking bays which are, for example, identified by numerals or letters which numerals or letters are in some way indicated on the bay whether by a plate or painting on the ground. The person desiring to use the parking meter simply inserts his or her card, details of which will be described hereinafter, into the card insertion slot 5 and then using the bay select button 6 presses it until the number of the bay that he or she has selected is displayed on the liquid crystal display 4. The driver then presses the time select button 7 until the desired parking time is again displayed on the liquid crystal display 4. The driver then presses the pay select button 8 to confirm payment. The liquid crystal display 4 sometime later goes into passive mode and displays the time elapsed for each of the four parking bays, thus, for example, it might look like:

A - 02.35
B - 00.04 EXPIRED
C - 00.15
D - 03.02 PENALTY

Thus, for example, bay A has two hours and thirty-five minutes of paid parking time remaining. Bay B has just run out of paid time four minutes previously. Bay C has a quarter of an hour of valid parking and finally bay D has expired three hours and 2 minutes ago. Then depending on the matter of operation of the parking meter as will be described somewhat later, this may be either that the parking meter is actually effectively free for use or somebody has not inserted his or her card on leaving the parking bay to indicate that the car has been removed.

This particular embodiment of the invention merely accepts token cards or electronic purse cards and these allow a value to be deducted from them each time they are used. Obviously if they are one-off use cards, then the meter simply credits them with that amount of paid time, or alternatively reads the card balance electronically and can ascertain whether there is sufficient funds or not.

The meter may be programmed so that if electronic purse cards or token cards with some elapsed time still on them are used that the cards may be disabled until they are reinserted into the meter. In this mode of operation the user is required to present the card a second time at that meter before driving off. Then and only then is the card re-enabled for further use. For example, there might be a prompt on the liquid crystal display 4 telling the user which of the buttons 6, 7 or 8 to press to re-enable the card.

It will be appreciated that since every one of these cards has by its nature a unique serial or identification number and each meter can be provided with a unique serial number, this feature is relatively easy to implement. It makes it relatively easy to impose a fine on the user who has not re-enabled their card. It is also possible then to reset the remaining time on the meter to "0" and thus prevent somebody else coming to the meter and using "unexpired time.

The parking meter 1 may also be programmed to display information in different languages. This may be activated, for example, by buying a special preprogrammed card with a language request, or, alternatively by the use of a separate control button, or simply by the use, for example, of the bay select button 6 and the time select button 7 simultaneously when various languages can be scrolled across the liquid crystal display 4 until the language of choice is reached when the remainder of the parking

operations can then be carried out with the liquid crystal display 4 giving all the instructions in the language of choice.

Further where the parking meter 1 is programmed with other information, the parking meter can, for example, display traffic and other information. It can also display advertising material and it could also display instructions as to the best way to drive to a particular destination. The amount of the traffic delays can be enumerated and indeed the insertion of a user's card in any parking meter in a particular area of the city could activate a display to say where the card was last used. This would allow a user, for example, to locate a motor car and is particularly advantageous where more than one person is driving the particular car and one person has parked the car and the other is to take it away.

The parking meter, for example, can give information as to whether there are available parking meters in a particular area. For example, one can envisage the situation where a person is about to remove their card from a particular parking meter and wishes to know whether there are likely to be parking meters available in another area of the city. This again can be displayed. The important thing to appreciate in relation to the invention for the user is that the number and amount of displays are endless having regard to the construction of the meters as will be hereinafter described.

Referring to Fig. 2 there is illustrated another embodiment of the invention comprising a parking meter indicated generally by the reference numeral 20 in the form of an architectural bollard. This is a type of metal pillar often used to prevent vehicles mounting the pavement. Thus, when produced in this form the parking meter 20 serves two functions, that of either a slave or master parking meter and also as a bollard. Instead of being in the form of a bollard it could be in any form of street furniture such as litter box, part of bus stop shelter, bench and the like.

Now referring more specifically to Figs. 3 to 6 inclusive, each parking meter 1 has a battery backed static random access memory (SRAM) and an electrically erasable programmable read-only memory (EEPROM). Both SRAM and EEPROM memory exist on separate electronic chips on a circuit board housed within the meter. Thus,

each meter comprises a microprocessor with data memory and program memory and is an intelligent device capable of storing information of various kinds. Each meter 1 also contains a radio transmitter and receiver and an infra-red transmitter. Each master meter 1M has a further communications link, in this case a land based cable 10, and modem 11 (while the cable has been illustrated between the modem 11 and each master meter 1M, in fact the modem 11 would be housed within the master meter) communicating with a computer forming a central host control unit 13. A plurality of hand-held inspection devices indicated generally by the reference numeral 14 having control buttons 15 and a liquid crystal display 16 are also provided. This can all be diagrammatically seen in Fig. 6.

Each slave parking meter 1S is in radio communications with a number of other slave parking meters which are all in turn linked by radio to the master parking meter 1M. The radio links are identified and illustrated by the reference letter R in Fig. 6 while the infra-red links are identified by the interrupted lines and the identification IR.

Thus if one meter's radio link fails for whatever reason a signal will be received by other meters as well as an indication of the failure of the radio link. Full redundancy of the communications links is desirable.

Similarly different communications systems may be provided again if desired in parallel for enhanced redundancy e.g. ultrasonic or optical light waves as well as or as an alternative to a radio or land line link.

Fig. 6 shows various different combinations of radio link that may be provided. Obviously each slave parking meter 1S and each master parking meter 1M can be programmed to provide any of these radio links, the number and versatility of these radio links being endless and can be in series or parallel.

Referring now specifically to Fig. 3 essentially the electronic equipment comprises in both hardware and software the following units namely: flash memory for the software 20 for a microprocessor 21, which includes memory for data 22, battery backup 23, an infra-red link 24 and radio transceiver 25. It further includes keypads and buttons 26 for operation of the various pieces of equipment, an LCD display as has been

previously described, the buttons 6, 7 and 8 are shown in Figs. 3 as is the liquid crystal display 4 and the card insertion slot 5. However, it will be appreciated that the portions illustrated in Fig. 3 are the electronic components of the physical units previously described and thus while the same reference numerals are used, it is important to appreciate that these reference numerals now refer to the control circuitry rather than the unit itself.

Fig. 4 illustrates the relay of data between slave parking meters 1S whereby redundancy which permits some of the nodes in the slave parking meters 1S to go out of service without compromising the rest of the radio link network.

In Fig. 5 there is illustrated in physical form a hand-held inspection device 14 in communication with a slave parking meter 1S.

Dealing again with the physical aspects of interrogation of a slave parking meter, a parking meter attendant with the hand-held inspection device 14 can interrogate any particular slave parking meter 1S or any master parking meter 1M to ascertain either the operation of the particular meter or the operation of all the meters in the particular area, or, indeed can interrogate a master parking meter to ascertain how parking meters in other areas are operating. Any query that a parking meter attendant would like to have answered can be answered via the infra-red link.

The people using this hand-held inspection device 14 will naturally fall into two types, those who are operating essentially as parking wardens or as maintenance staff. The infra-red link would operate at a distance of one metre or less. The type of information each member of staff would require would be somewhat different for example, maintenance staff require to check battery levels and other information in respect of the meters, while those operating as parking wardens will be looking for card transaction details etc.

The link to the central host control unit 13 will allow the host operators to obtain information on parking patterns and trends which may impact on long term traffic flow planning etc. They will also be able to change the time available on meters on a real time basis. They will further be able to download any information in relation to traffic

etc. that they wish to download on the land based cables 10 to each master parking meter 1M which can in turn download the information through its radio links to each slave parking meter 1S.

Each parking meter 1 accepts chip cards which can either be, as mentioned above, simple tokens much like the well known phone card or chip cards which have electronic purse functionalities such as those sold under the Trade Marks "VISACASH", "MONDEX", "PROTON" or "DANMONT".

A touchscreen could be used as a user interface on the parking meter. This will be particularly advantageous where it is desired to provide many different displays for example multi-language instructions. Since these systems do not require the use of mechanically activated switches or buttons, they are particularly advantageous for use with the invention.

In this specification the term card or programmed card is used to include any programmable device whether in the physical form of a card or not. For example, they could be in the form of a key, key ring, key ring tab and so on. Indeed an insertable device is not necessary and it could be a contactless device. Infra-red or the like transmitter devices on a suitably coded device could be used. Suitable encryption coding may be incorporated in the card.

It is important to appreciate that the central host control unit can at any stage query the real time behaviour of master parking meters 1M or slave parking meters 1S, such as, for example, and not exclusively

- diagnostic data in relation to battery charge levels, accuracy of internal real time clocks, etc.

- event data such as memory failure, card write failure, card read failure, etc.

- exception reporting such as attempted use of black- listed cards or other means,

- financial reporting such as current daily or hourly payments, and

- historical data such as the times of each transaction, the serial number of cards used, etc.

For example, it is envisaged that each motor car may be provided with only one card. Thus, the use of that card by a particular user will determine how often that particular card is being used. Thus, some restriction can be placed though not obviously an absolute one on the use of parking within the city by individual users.

Obviously, it is difficult to prevent the feeding of meters since the user can have more than one card if the cards are sold as a separate unit. However, if the cards are not sold as a separate unit and only electronic purse functionality cards are sold then it is possible to identify very clearly when somebody is feeding a meter irrespective of whether they use the same card sequentially which would show it immediately or if they use a different chip card since these chip cards would be registered to the same individuals. Obviously, where the chip card is effectively a simple token card then a user can buy more than more one card and thus, as it were, cheat on the system. However, the use of chip cards with electronic purse functionality only greatly reduces this.

It will be appreciated and one of the major advantages of the present invention is that it is a network of multi-bay parking meters each having an intelligent electronic control system which permits time based payments of on-street parking with full reporting of all operations.

The terms "include, includes, included and including" and the terms "comprise, comprises, comprised and comprising" are used interchangeably in this specification and the widest possible interpretation and scope of the terms should be afforded to them.

The invention is not limited to the embodiments hereinbefore described but may be varied both in construction and detail within the scope of the claims.

CLAIMS

1. A parking meter system comprising:-

at least one set of meters, namely, a master meter and a plurality of slave meters for control of parking bays;

an operations controller for each meter;

an elapsed time display for each meter connected to the operations controller;

a set data communications link between the meters in a set of meters;

a central host control unit for the master meter; and

a main data communications link between the host control unit and the master meter.

2. A parking meter system as claimed in claim 1 in which the set data communications link is a radio link.

3. A parking meter system as claimed in claim 2, in which the radio link between the meters is between each slave meter and each master meter in series and parallel.

4. A parking meter system as claimed in any of claims 1 to 3 in which the control means is an electronic control means.

5. A parking meter system as claimed in claim 4 in which the electronic contrd means is operated by a programmed card incorporating payment means for debiting on payment for parking.

6. A parking meter system as claimed in claim 5 in which the payment means

incorporates means for storing as a card credit a preset amount of currency for subsequent debiting on payment for parking.

7. A parking meter system as claimed in claim 6, in which the payment means incorporates limit means to prevent use of the card after the card credit stored falls below a preset limit.

8. A parking meter system as claimed in any of claims 5 to 7 in which refund means is provided for crediting the card with a payment made for unused parking on reinsertion of the card on vacating the parking bay.

9. A parking meter system as claimed in any of claims 5 to 8,in which additional debiting means is provided for debiting the card with previously unpaid for parking.

10. A parking meter system as claimed in any of claims 5 to 9, in which the control means includes disabling means to prevent reuse of the card until reactivated by reinsertion into the meter where last used.

11. A parking meter system as claimed in any of claims 5 to 10. in which the control means includes reset means to delete any unexpired parking time stored in the operations controller as available for use and to reset the elapsed time display to indicate the state on reinsertion of a card on vacating the parking bay.

12. A parking meter system as claimed in any preceding claim in which location means are provided for indicating on insertion into a meter the identity of the previous meter where the card was used.

13. A parking meter system as claimed in any preceding claim, in which each operations controller has storage for two operating systems and incorporates means for switching from one system to the other.

14. A parking meter system as claimed in any preceding claim in which the meter

includes display means for providing useful, as defined herein, information to the user.

15. A parking meter system as claimed in any preceding claim, in which the meter includes means for preventing the operation of a meter until additional vehicle identification means is inputted into the meter.

16. A parking meter system as claimed in any preceding claim comprising:-

a plurality of sets of meters;

means for downloading to a master meter through the data communications link information from other master meters; and

means for accessing this information at each master meter.

17. A parking meter system as claimed in any preceding claim comprising:-

a short range transmitter for each master meter; and

a receiver for reception of data from the meter.

18. A parking meter system as claimed in claim 17, in which the short range transmitter is additionally provided for slave meters.

19. A parking meter system as claimed in any preceding claim, in which each meter is a stand-alone unit having its own microprocessor unit and capable of operating independently of other units.

20. A parking meter system as claimed in any preceding claim in which each meter controls more than one separately identifiable parking bay.

21. A parking meter system as claimed in any preceding claim, in which public display units are provided connected to the central host control unit to display

relevant information to the public.

22. A parking meter system substantially as described herein with reference to and as illustrated in the accompanying drawings.

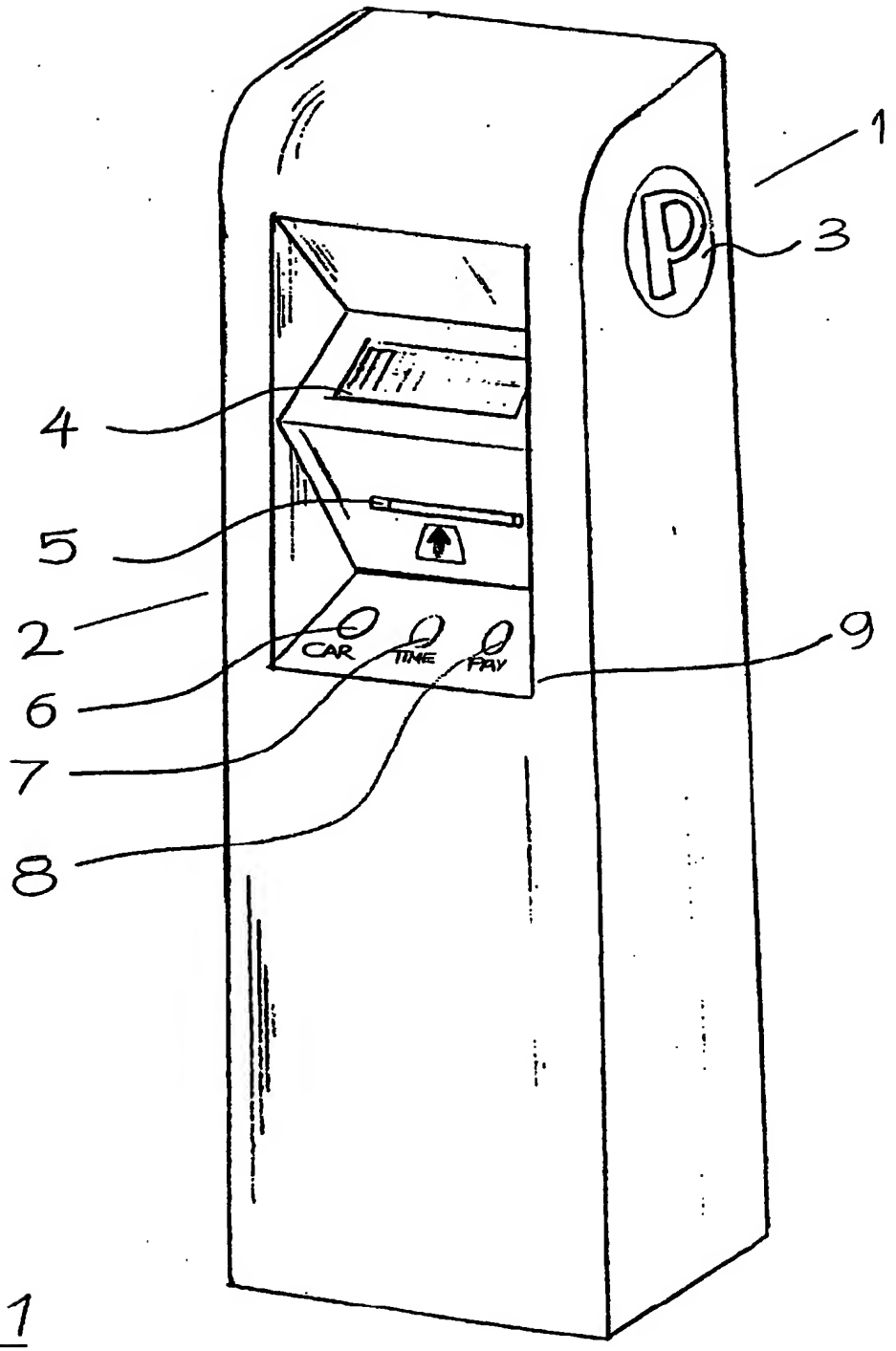

FIG 1

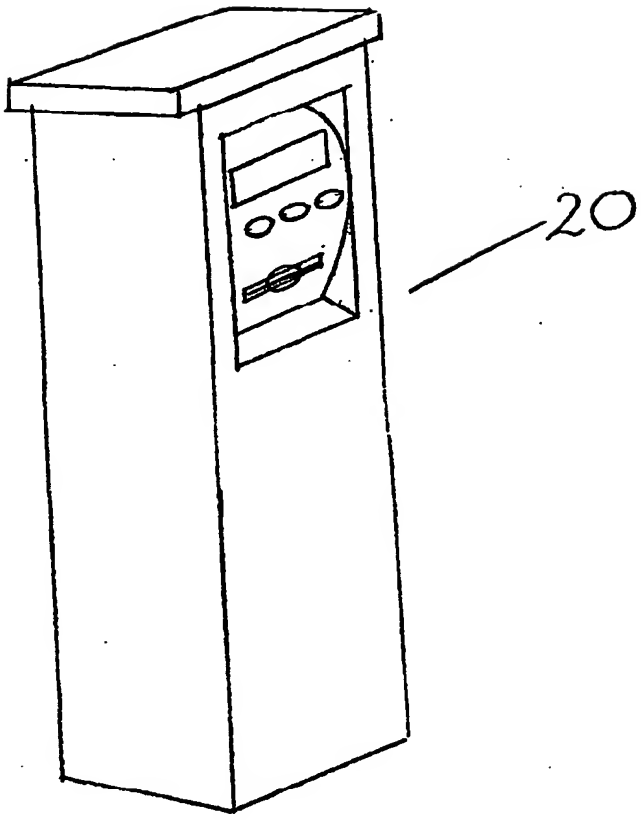

FIG2

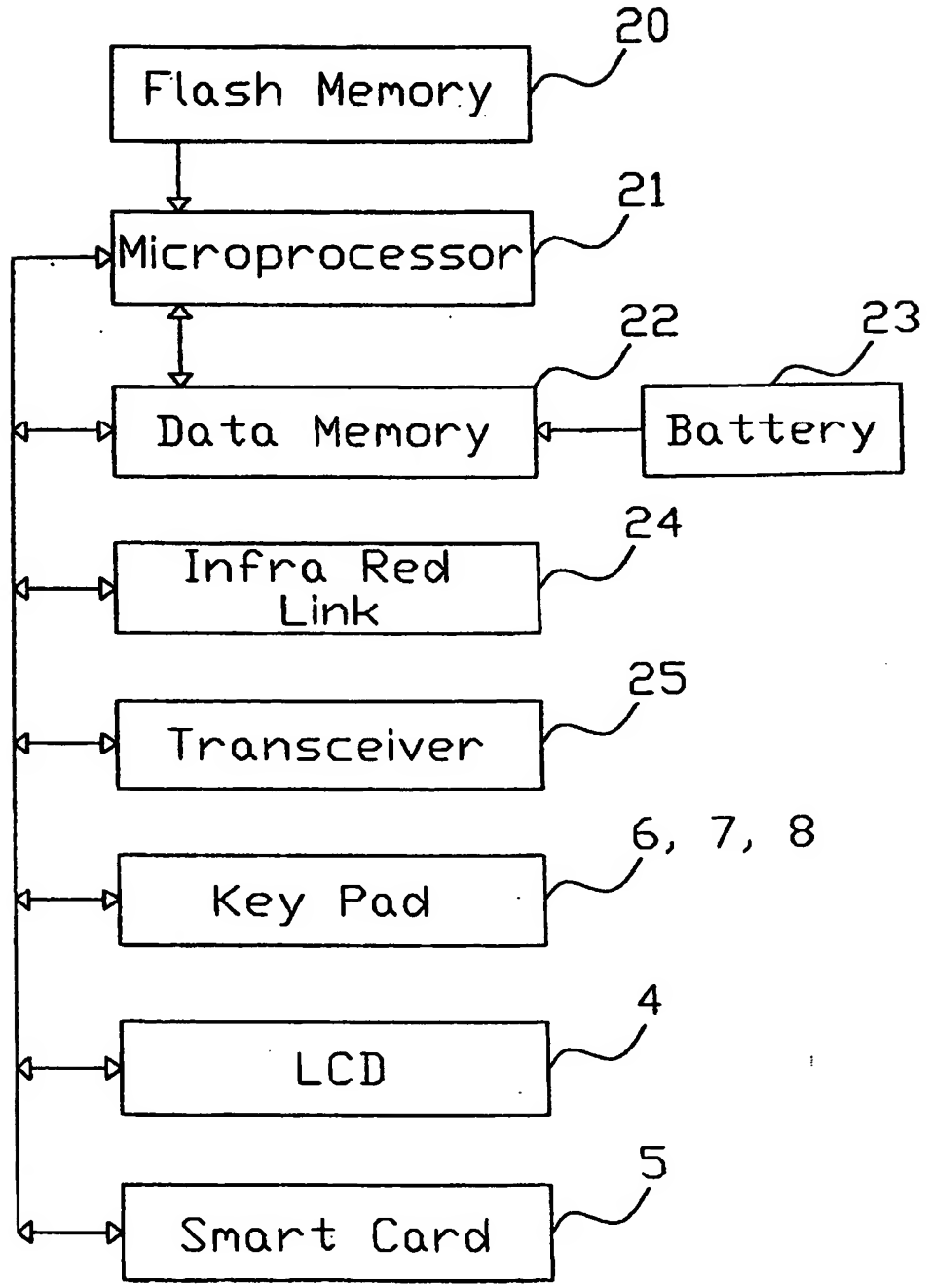

Fig. 3

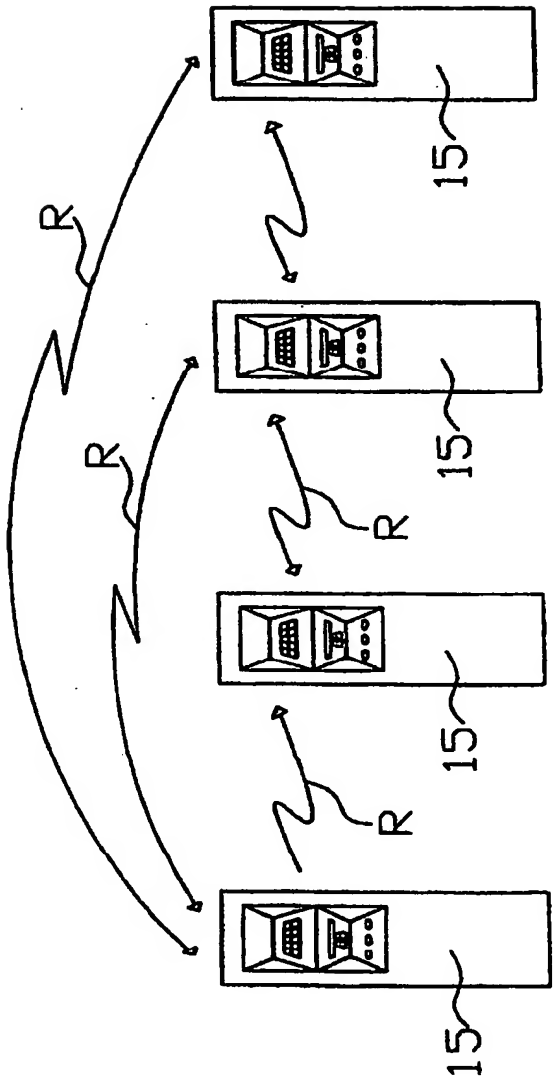

Fig. 4

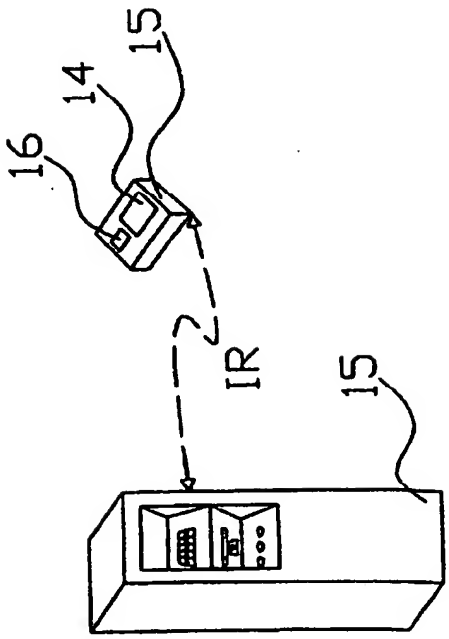

Fig. 5

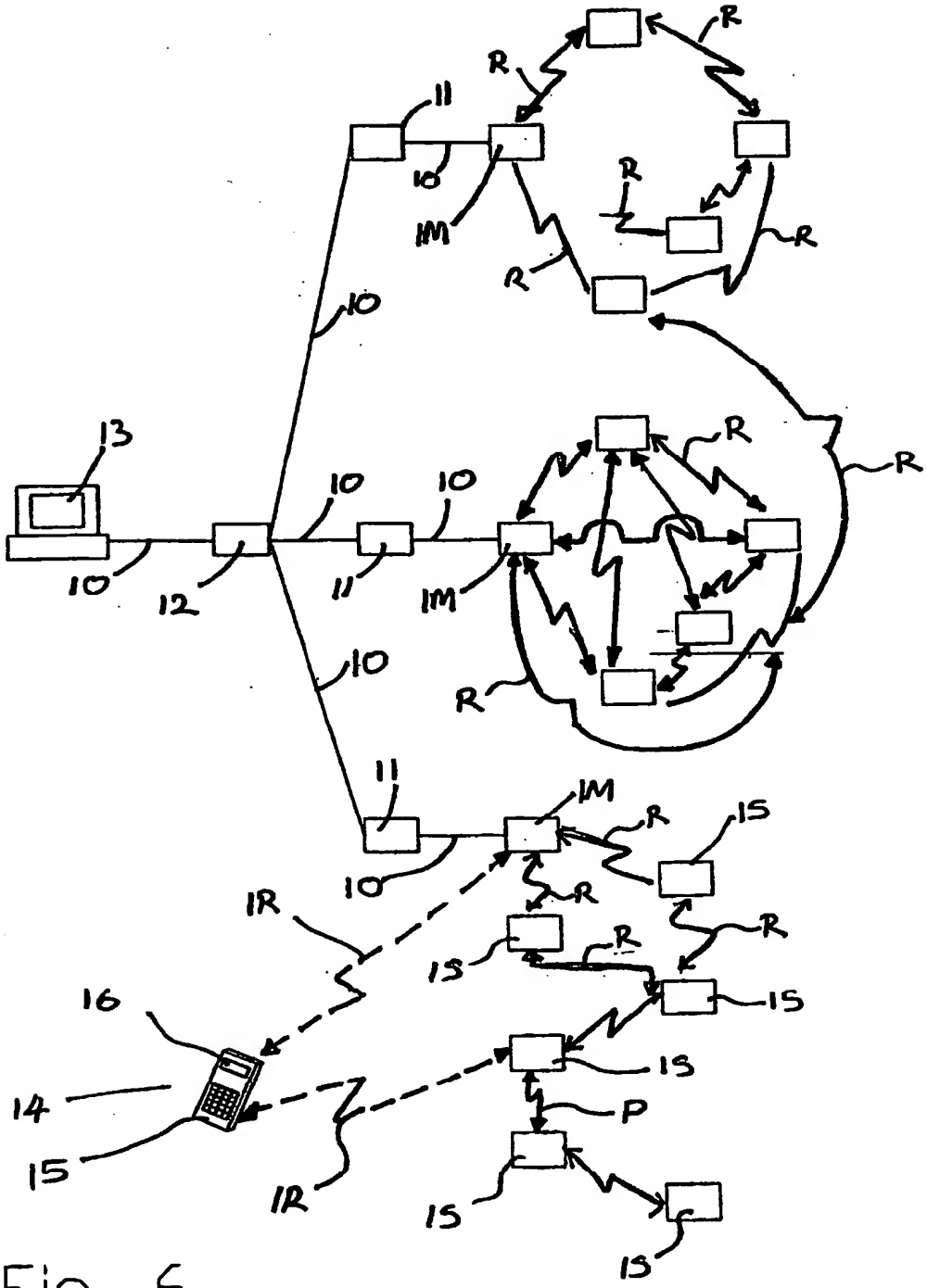

Fig. 6

INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/IE 98/00085

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G07F17/24 G07B15/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G07F G07B G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97 37328 A (PARCOFLEX INC ;OUIMET LUC (CA); LEOUTSARAKOS NIKOLAOS (CA)) 9 October 1997 see abstract; claims; figures see page 5, line 3 - page 10, line 32 ---	1-6,14, 16,19-22
Y	US 5 648 906 A (AMIRPANAHI FARDOSHT) 15 July 1997 see abstract; claims; figures see column 2, line 54 - column 3, line 44 see column 6, line 39 - column 7, line 59 see column 15, line 31 - column 17, line 28 ---	1-6,14, 16,19-22
A	FR 2 566 942 A (MILLON SERGE) 3 January 1986 see abstract; figures ---	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 February 1999	18/02/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Meyl, D

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INTERNATIONAL SEARCH REPORT

Int tional Application No
PCT/IE 98/00085

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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